Vol. XI. No. 12. June 4, 1914

THE JOURNAL OF PHILOSOPHY
PSYCHOLOGY AND SCIENTIFIC METHODS

A DEFINITION OF CAUSATON. III

IN the two preceding papers we have carried out the empirical method of investigating the meaning of causation through the field of statics, and through part of dynamics. In accordance with the plan drawn up in the first paper, we shall now continue the inquiry through the remainder of dynamics, the "properties of matter," and the field of electricity. These, we decided, offer in the present state of science the only types of causal connection which are deserving of analysis, since all other types are reduced to some or all of these three. The next case in order is that of

Impact

This may be viewed as a case under Newton's second law, if we consider the acceleration given by one of the bodies to the other: if we consider the motion of both bodies before and after the collision, it falls under the third law. It seems to be a typical case, in dynamics, of action and reaction between moving bodies. The interest of it lies in its being treated as the type *par excellence* of *all* causation, by those who defend a mechanical philosophy of nature. Some, though not much, work has been done toward analysis of it in monographs little known to English-speaking philosophers.[1] This case also differs from anything previous in being more complex. There appears to be a decided change of quality between cause and effect, in contrast with the simple uniform series and the simple combination of two forces into one, which were examined in the last paper.

We shall begin with an artificially simple case. The bodies are supposed smooth and non-rotating perfect spheres, perfectly elastic or imperfectly elastic. The question, whether there is actual contact, may be neglected.

Elastic smooth spheres in direct collision, where there is no rotation, obey the following law. If the bodies have, respectively, masses

[1] R. Schellwien, "Das Gesetz der Kausalität," page 17; A. Kowalewski, "Ueber das Kausal Problem," pages 14–17; A. Farges, "Theorie Fondamentale de l'Acte et de la Puissance," pages 223–24; *et al.*

A and B, velocities u and v before collision, U and V after collision:

$$Au + Bv = AU + BV.$$
$$u - v = V - U.$$

$Au + Bv$ is the total momentum of the two bodies before collision; when they are moving in the same direction Bv is positive, when in opposite directions Bv is negative. In the same way, $AU + BV$ is the total momentum after collision. This means that whatever momentum A loses is taken up after collision by B, and conversely. For $Au - AU = BV - Bv$, where the left-hand member is the loss in A's momentum and the right hand member the gain in B's momentum. At contact with B, A's momentum is simply split into two parts and one of them transferred to B. It is analogous to a resolution and subsequent combination of forces, except that it here applies to momenta and occurs in the same straight line. The two parts of the whole process, before and after impact, thus reveal identity at every stage, in spite of the apparent difference. But the identity is yet more complete. The total momentum is not only the same throughout, but it travels along in the same direction and at a uniform velocity. It is going just as fast before the impact as during the impact and after the impact. That is, the center of mass of the whole system (a property already accounted for by the principles of statics) moves onward continuously at a steady rate. Its velocity is easily found to be $(Au + Bv)/(A + B)$. The whole system, then, is a case of the first law of motion: even the individual momenta considered by themselves are preserved, though the same velocity does not continue with the same mass. The reason why the case of impact seems irreducible to one of the first law is that velocities suffer change after impact. It is a reason analogous to that which made composition of forces seem paradoxical. One line can not by itself *be* another line, we admitted: but when it is considered from the point of view of its relations to other lines, it can have several directions at once. So here: the velocities before and after impact are different; but when we remember that velocity is not something by itself, but is *of a particular mass*, the later velocity may be seen to admit a possible identity with the earlier velocity. The transfer of a velocity unchanged from one mass to another greater or less mass is *not* the transfer of something identical from one situation to another; for the same velocity of a greater or less mass is a very different thing. In the case of a uniform motion under the first law, the mass is constant and hence the velocity persists unaltered: but it did so because it was the velocity of a constant mass. Here, too, the velocity is preserved, but because it is the velocity of a different mass after impact, it assumes a different value. The loss in velocity of A is $u - U$; the

gain in velocity of B is $V-v$; but $V-v=(u-U)\cdot A/B$. The velocity which B gains is just that which A lost, adapted to the mass of B. The apparent differences are then due to the original elements of the event persisting in new circumstances.

We can represent the whole process as a series whose elements x are successive positions of the momentum of A; at the instant of impact this is resolved, but the sum of the resolved momenta continues this series uniformly onward. Thus:

$$x_1, x_2, x_3 \cdots x_n \left(= \begin{matrix} x_{A_1} \\ x_{B_1} \end{matrix} \right), \quad x_{n+1} \left(= \begin{matrix} x_{A_2} \\ x_{B_2} \end{matrix} \right) \cdots .$$

And we may do the same with the successive positions of the momentum of B; and with the motion of the center of mass of the whole system. This reduces the case to one of the first law, with the principle of resolution included. No new type of causation is found here.

Of wholly inelastic bodies in direct collision the same holds. The differentia of this case is that, instead of $u-v=V-U$ we have $U=V$. The bodies do not rebound, and consequently move on together after impact, in the direction in which the body with the greater momentum was moving. Just as with elastic bodies, the loss in momentum of A is gained by B, the center of mass moves onward uniformly, the velocity is transferred, adapted to B, and a resolution of momenta occurs along the line of motion. The kinetic energy after the collision is less than before, because some of it has gone into heat in the bodies; but the momenta are preserved just as with elastic bodies. Consequently—with the exception of this transfer to heat—this case is of the same type as above. Now the phenomena of heat are explained by physics on the supposition that it is motion of the molecules of a body. It presumes that the kinetic energy, *i. e.*, half the squares of the velocities times the masses, of all the particles of the bodies, which is not continued in the form of molar motion after the impact, could with sufficient knowledge of detail be equated to the same function of the internal motions. Even here, then, there is believed to be no exception: the motions of masses continue undestroyed, though we can not trace the causal sequence in detail. Of partially or imperfectly elastic bodies,—which comprise all known actual cases—the equation $u-v=V-U$ becomes $e(u-v)=V-U$, where e is the "coefficient of restitution," representing the amount of return to its original shape of a body after the deformation due to impact. The introduction of e is indifferent to the conservation of the momenta; it simply determines the amount of kinetic energy transformed into heat. For the way in which elasticity acts we may refer to the later discussion. Apart from that, no new principle is involved.

Oblique collision is treated by the same methods as direct collision, *after* the velocities have been resolved into suitable components.[2] It is, therefore, a combination of the above types with that of the type of resolution of velocities, and offers nothing new for our purposes.

Change from Potential to Actual Motion and the Converse

When a body is shot upward from the earth's surface with a certain initial velocity, that velocity decreases uniformly until the body reaches the highest point of its journey, passes through zero velocity, and returns with uniform acceleration. Let us suppose the rise and fall of the body to be exactly vertical. Imagine also that at the turning-point of its flight a rigid support is suddenly thrust under it, fixed there for a time, and then removed. This furnishes a clear picture of the change from actual to potential motion and the converse. The whole process is subject to law and is, therefore, causal throughout. What is its make-up?

As the body flies upward to its highest position, each stage through which it passes is compounded of two causal processes—the attraction of the earth and the continuation of initial velocity—each of which processes conforms to the type already described. We need not concern ourselves further, then, with this portion of its flight. The velocity which results, at every stage, decreases regularly until it has the value zero. If no support were put in, it would pass through the zero value and become negative, *i. e.*, a velocity of contrary direction. The whole series would thus be quite analogous to the case of pressure at one end of a bar balanced on a fulcrum, which is transmitted to the other end of the bar; a case examined under the head of statical causation. But when the support is thrust in, the motion ceases for a finite period of time. The body is then said to have potential energy due to its position, or the work already done in raising it. The downward motion does not exist; no motion exists, and there is said to be a *tendency* to move downward.

Observe first that this is a real condition, and an identifiable one, described by more than the word *rest*. The body exerts *pressure* upon the support, and this pressure *is* its potentiality. When the physicist speaks of this potential energy as something "metaphysical"[3]—meaning, of course, inaccessible to observation—he is, I venture to think, more modest than is necessary. Pressure might be objectively as real as form and size. There is no reason *a priori* why the content of touch-sensations should not be as objective as the qualities given in visual sensation. The thing is a question of fact.

[2] *Cf.* Williamson and Tarleton, *op. cit.*, pages 70–72.

[3] Thomson's and Poynting's "Heat," London, 1911, page 116, note.

Is there evidence that pressures continue—as colors, sounds, etc., do not—when we do not perceive them? There is such evidence. *Whenever* the support is removed, the body falls. Therefore it was pressing downward, tending to fall, all the time. Its existence is as objective as motion is, and as independent of our perception; it is not a "secondary quality." In fact, the reason assigned for believing in potential energy by the authors above referred to is that the energy of motion which is lost appears again when the body falls;[4] just the reason why we believe in the existence of the bodies themselves when we look away from them.

As soon as the support is placed under the body, a composition of forces occurs, giving equilibrium. The downward pressure of the body is exactly equal to the upward pressure of the support. The series of velocities constituting the hitherto motion continues, but is at this point compounded with another series; the continuous upward push of the support. It is the same sort of thing that we found in the collision of bodies. *There* the uniform motion was not destroyed, but compounded at the moment of impact with another uniform motion. So here, the series of velocities in the rising body continues, but is compounded with the resistance of the support and, as it were, turned in a different direction. The potentiality here is simply a special case of composition, such that the forces compounded are equal and opposite. In fact, we might define potentiality as equilibrium. Nothing whatever is destroyed; rather something is added to each of the factors, *viz.*, the opposite factor. This explains the familiar Thomistic-Aristotelian doctrine that a potentiality by itself is never a cause of an event; for nothing happens unless the equilibrium is destroyed. It agrees also with Ostwald's second law of energetics, that no event occurs unless there is an uncompensated difference of potential factors; since an uncompensated difference is equivalent to the fact that there is no equilibrium. Or, again: "when the parts of a body or of a system of bodies are in any degree free to adjust themselves under forces that exist within the system, they will always so arrange themselves as to make the potential energy of the system as small as possible,"[5] *i. e.*, the differences compensate themselves as far as possible. So far, then, there is a continuation of the original series plus a compounding of it with the pressure of the support.

As soon as the support is removed, the composition is succeeded by a resolution. The support no longer combines with gravitation to produce equilibrium, and the latter force acts alone in the manner stated under the topic of gravitation. In the whole process, from

[4] *Op. cit.*, page 110.

[5] D. W. Hering, "Essentials of Physics," New York, 1912, page 45.

beginning to end, there does not seem to be any new type of causation besides the serial type and the type of composition.

This completes the list of cases under mechanical causation. It will be observed that the principle of composition plays a large part; so large, indeed, that all the complex cases are reduced to simpler types by its aid (or that of its closely allied form, the principle of resolution). A principle so ubiquitous and so useful would seem likely to have some philosophical significance. In the writer's opinion it has; and accordingly before passing to the topic of "Properties of Matter" we had best pause to consider that significance.

A Generalization from the Principles of Composition and Resolution

We have seen that a combination of forces may really contain the components intact. They may, in combining, pass from the actual to the potential state, or the converse, or may be combined as already potential and remain so, or as actual and remain so. This is philosophically a significant result. One philosophical objection to the objective reality of the scientific concepts is based on the assumption that they are not, when combined as they are in reality, preserved in the same form as they have when treated alone. Now, as a result of empirical investigation we have found that this is not true. They are at least sometimes so preserved. As a *general* criticism of science, then, this philosophical view should not stand. When, however, the view is based, not on an assumption which can not be verified, but on an ultimate doctrine of internal relations, it is a different matter. Such a view declares that whether parts are changed or not when combined into wholes, the ultimate metaphysical *account* of the parts must be formulated in terms of the whole. That is not inconsistent with the empirical facts, and shall not here be discussed. Our only present concern is to point out that if science is not metaphysically ultimate, it is not because the parts with which it deals fail to exist. The analytic treatment is true to existence.

A corollary of some importance to the philosophical estimation of our present method is that it is right (barring dialectic, etc.) in treating types of causation singly. In the manifold and very complex combinations of them which constitute real individual events, each kind of causation may well be preserved intact. The artificially simplified laws of the text-books may never be realized alone, but they are real *tendencies* and sometimes real *processes,* working uninjured by the environment with which they combine. Had the deniers of the existence of abstractions considered the detailed empirical evidence, they would, perhaps, have avoided such a doctrine.

Are there, then, real rigid bodies, projectiles moving in straight lines or perfect parabolas, totally inelastic bodies, etc.? There are

bodies whose tendency to behave as perfectly rigid, etc., combines with other tendencies to produce a resultant which is not as a whole the behavior of a rigid body, etc. The abstract concepts of science denote, in general, real tendencies in Nature, which are never destroyed or lost, but combined with other and often opposing tendencies. We may say, if dialectic, idealism, or other views command it, that science does not deal with ultimate reality; but we should not, it appears, say that science deals with the non-existent. Tendencies exist as much as anything else.

This completes the list of cases under mechanical causation. We pass next to the second of the three groups marked out above.

II. Properties of Matter

1. *Elasticity*

The elasticity of gases and liquids depends upon that of the solid particles composing them; so we need examine only the properties of elastic solids.

An elastic solid has the following property: "if the applied forces and the consequent strain [of the body] be confined *within certain limits,* the body offers continuous resistance to the strain, so that *it requires the continued exertion of external force* to maintain the body *in a given state of strain*; and when this force is removed the body *tends to return* to its natural state . . ." other conditions being equal.[6] Also "It always requires the same force (or system of forces) to maintain the same strain at the same temperature . . ." (p. 6). This, however, holds only of perfectly elastic solids; it is not a universal law of matter. Even a very elastic body has its *limits,* such that any strain greater than a certain amount renders it *ductile.* "In this condition the resistance still increases with the strain, but much less rapidly than before the limit was passed, and the tendency to return towards the natural state is much diminished, so that, when the external force is removed, the body is found to have acquired a 'set' or *permanent strain*" (p. 4). Beyond this region of greatly diminished elasticity lies breakage; sometimes, as in the case of brittle bodies, breakage supervenes almost directly upon the elastic limit. Also, "by sudden and violent changes of temperature, many substances, and notably metals and glass, may be entirely altered in all their elastic properties" (p. 5), which property "is obviously analogous to that [change] produced by straining it beyond its elastic limits" (*ibid.*). But even *within* the limit, resistance to strain varies with the rate at which the strain is imposed, as well as with frequency and recency of strain (fatigue).

[6] W. J. Ibbetson, "Mathematical Theory of Elasticity," page 4.

We may, then, classify the events that occur in this domain under two heads: (1) cases of approximately perfect elasticity, such as the behavior of metals, crystals, glass, jellies, etc., within their elastic limits, not subject to viscosity or fatigue or "temper," and (2) all other cases, including even approximately inelastic substances such as tallow, putty, etc. Let us discuss these separately.

1. The elementary event is this: when a certain force has been applied to a body, followed by a change of shape or volume, then upon release the original volume or shape is restored. Scientists believe that there are certain intramolecular stresses which bring about this restoration. This is in itself no more mysterious than gravitation, which pulls back to earth a raised body. But it is not known how these forces move the particles of the elastic body; with what velocity and acceleration or with what relation to the mass or displacement. The behavior of gravitating bodies has been accurately described and measured, and found to conform to Newton's first law; but of the molecular behavior of elastic bodies we know little or nothing, and can not say whether it reduces to a mechanical or to some other type. We must wait for further evidence.

2. The other cases confirm this statement. The intramolecular forces do not always work. Sudden strain, too great strain, too prolonged or recent strain, etc., render them ineffective, or nearly so. Why this is so, is not understood; which is only another way of saying that the nature of the molecular stresses is not known. If we knew their behavior we should know how it is that these conditions affect it. Here, then, the result is disappointing. We get no data for causal analysis.

Nevertheless, so far as the behavior of these forces *is* known, we may say that it is a case of potential energy leading to kinetic energy, the latter being that of the motion undergone by the particles in restoration to the original shape and volume. The potential energy becoming kinetic is a case of the kind already considered under dynamics. It appears to be an energy of position, giving rise to motion of masses upon release of the detaining force.

2. *Friction*

This is of two kinds, sliding and rolling friction. Sliding friction is explained thus: "When one of the bodies tends to move over the other, the projections interfere and tend to stop the motion."[7] Why the coefficient of friction is different in different substances is known only in a general way, *viz.*, some substances are rougher, have more projections, more rigidity, than others. No exact explanation of the particular values of coefficients is at present available. That there

[7] E. L. Hancock, "Applied Mechanics for Engineers," page 261.

should be such a thing as friction seems, from the above explanation, to be due to the fact that bodies resist change of shape. The motion is then transformed into heat, *i. e.*, motion of the particles: this reduces to a case of impact, therefore, and is a dynamical type. When a body resists change of shape or breakage, we have a case of cohesion—of which later. That sliding friction is nothing more than these, is indicated by the laws of Morin: the friction between two bodies is directly proportional to the pressure, and independent of the area of contact.[8] For increase of pressure means increase in the number of collisions between irregular projections in the surfaces. And the fact that static friction is greater than kinetic is due to the fact that in the state of rest there are more points of contact between the two bodies—owing to the sinking of the upper body on the lower —than in the state of motion. As far as sliding friction has been analyzed, then, there are no types of causal connection found but mechanical ones.

When the surfaces are lubricated, "the projections of one do not fit into the other, but are kept apart by a film or layer of the lubricant."[9] Here it is not a matter of collision between projections, but of internal friction in the lubricant, of the attraction of its particles for one another, of their adhesion to the surfaces of the bodies, and of the substitution, in part, of rolling friction for sliding friction. The events herein involved—except for the rolling friction—come under the head of molecular attraction and cohesion: of which later.

Rolling friction depends upon deformation of one surface by the pressure of the other: a wheel is flattened by the road and the road depressed under the wheel. Instead of collisions we have pressure. When the road-surface is very elastic, the depression is relatively deep, and the road rises immediately behind the wheel almost as steeply as in front. The depth of the depression here occasions slipping, *i. e.*, sliding friction; the case just considered. The unique characteristic of rolling friction is, then, resistance offered by pressure, and the causation is here statical and dynamical.

3. *Resistance of a Medium*

This situation is due partly to inertia of the particles of the medium, and partly to another factor classed with friction under the head of "passive resistances."[10] "If a mass m be supposed to move in a straight line, without rotation, in a resisting medium, the resistance is a function of the velocity of the body. . . . If the resistance be represented by $\phi(v)$, the equation of motion becomes

[8] *Op. cit.*, above, page 263.

[9] *Op. cit.*, page 265.

[10] Minchin, "Statics," page 75.

$$m\frac{dv}{dt}=F-\phi(v),$$

where F is the external force acting along the right line. It is usual to assume, with Newton, that $\phi(v)=\mu v^2$, where μ is a constant depending on the density of the medium.''[11] This law, however, is of limited range; in some cases the resistance increases with higher powers of the velocity. The causes are, in fact, unknown; we can not tell in detail how the resistance acts. The data give us no definite type of causal connection.

4. *Density*

This property is not regarded as explained, except, in the case of gases, by the number of molecules. Its causes are believed to lie in the structures of the various substances, but just where or how is not known. No material is here given us for analysis.

5. *Cohesion*

This is believed to be a general property of matter which probably reduces to molecular attraction of some sort, but whose detailed behavior and laws are little known. If two smooth surfaces are pressed together very hard they tend to adhere as if glued. Gluing makes bodies adhere because, after drying, there is very little space between the particles. ''There is no real difference between adhesion and cohesion.''[12] Unfortunately, this amount of information will not suffice for a causal analysis.

6. *Gravitation*

The source of this property is also unknown, though theories are extant.[13] It is also unknown whether or not it acts instantaneously. It is believed, however, to act uniformly in a straight line, for it obeys the law of inverse squares, like light, radiant heat, and many other phenomena which proceed in straight lines. The law of inverse squares is a simple deduction from the property of action uniformly in a straight line, as that action radiates in all directions from a given body in space. The mode of action of gravitation, then, is analogous to that property of uniform motion by which it continues uniform in a straight line. Its type of behavior will, therefore, come under the same serial description as uniform motion (discussed in the preceding paper).

[11] Williamson and Tarleton, ''Dynamics,'' page 219.

[12] Ganot's ''Physics,'' Eng. tr., 18th ed., page 10.

[13] *E. g.*, W. Sutherland, in *Philos. Mag.*, December, 1904.

7. *Crystallization*

"Definite chemical compounds almost always possess *some* power to crystallize, though certain usually crystallized substances may be made to assume an amorphous [non-crystallized] form by very much accelerating their rate of solidification . . ." "Substances which are only known in the amorphous state are usually of indefinite chemical composition, like coal, amber, or opal."[14] Crystallization thus appears to be a general property of matter, so far as it possesses definite chemical structure. As to its make-up: "The physical behavior of crystals . . . necessitates *units of structure,* or elementary particles by whose regular arrangement the crystal is built up. As such units we may assume the physical molecules . . ."[15] "If the crystal elements or physical molecules of a given substance possess the same size and the same attractive forces, then, in case these molecules are perfectly free to act and react upon each other, they must all assume a similar position relative to one another, *i. e.,* such a position that equivalent directions of attraction and repulsion in all the molecules shall be parallel" (p. 5). That is "*the grouping about any molecule must be the same as about every other*" (p. 6). "Thus the study of crystal structure becomes an investigation of the possible networks of points in space which satisfy these conditions" (p. 6). In other words, this situation is one of statics and dynamics. The causes of crystallization are "molecular forces which tend to produce a regular internal structure in matter as it slowly solidifies," and these forces are conceived to act under the laws of statics and dynamics.

Further, "we may have crystals identical in composition and in all their physical properties, but bounded by very different sets of planes, all of which are equally possible with the same internal structure. Such differences in form among crystals of the same substance condition what is known as *crystal habit*" (p. 12). "Exactly what it is that determines the habit of a crystal is not known" (p. 13). "*The growth of crystals, i. e.,* the relative development of the different faces, is very variable, and often irregular. . . . The conditions controlling these distortions are not well understood."[16]

So far, then, there does not seem to be any definite type of causal process in the formation or the growth of crystals, over and above those already discussed. The nature or origin of the molecular forces is not known; their mode of action in determining structure is mechanical; "habit" and growth are not understood.

[14] G. H. Williams, "Elements of Crystallography," page 7.

[15] *Op. cit.,* page 4.

[16] W. Nernst, "Theoretical Chemistry," page 79.

8. *The Principle of the "Indestructibility of Matter" (i. e., of Mass)*

"Numerous investigations have shown that neither by physical change of a substance, as, for example, by pressure, heating, magnetization, etc., nor by chemical decomposition, does there occur a variation of its mass as measured by the attraction of the earth."[17] In fact, the whole atomic theory of chemistry is a reduction of apparently diverse facts to terms of ultimate permanent units. This is on a par with what we found in physics, as to conservation of momentum. From the point of view of a series of instants or short periods in time, the unchangeable character of mass appears as a process whose logical structure is the same as that of the series describing uniform motion, inertia, etc.

The principle of the conservation of energy seems obviously to come under the same rule. It is, however, so broad and general and, where formally stated, so lacking in concrete detail that by itself it gives but a faint idea of the operation of causation; hence we content ourselves with this brief mention of it.

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REGULATION IN BEHAVIOR

SEVERAL years ago there appeared in *Nature* an account of a statistical inquiry into sex determination. The results indicated that children born to young mothers were predominantly girls and that those born to old mothers were predominantly boys. Whether this hypothesis has been borne out by further results I do not know, but, assuming it to be a law, it is an example of what has been called regulation in behavior. The purpose which such a process serves is clear. When there is a shortage of women in a community girls are likely to marry when very young, due to the increased opportunity afforded them on account of the under-supply of more mature women. If such marriages result in a number of female infants greater than the normal expectation, the balance between supply and demand is thereby reestablished. A similar compensation is had when, in a society where females predominate, and hence are not married so early in life, male offspring are in excess.

The world is full of instances of this sort. Organisms utilize the very difficulties they encounter in order to bring about the removal of these difficulties. Their make-up insures this regulation. They do not depend on outside guidance to carry them through adverse situations. The adverse situations in combination with an organism

[17] W. Nernst, "Theoretical Chemistry," Eng. tr., page 4.

are self-eliminating. Of course this is not always true for the individual, but the social group, which is the larger organism, survives because the procreation of its parts is as rapid as their destruction.

We often so construct a piece of machinery that this principle of auto-adjustment holds in its behavior. This is done so that we may not have to manipulate it and direct it to any great extent. The floating ball disconnects the circuit and stops the pump when the tank is full. The pendulum swings to one side and releases the air pressure which tilts the wing tip of the aeroplane when a gust of wind causes it to pitch or roll, and this restores equilibrium. The electric sterilizer is supplied with a soft metal plug which melts off and releases a spring, so breaking the circuit, when the water is exhausted. Otherwise the rheostat would be burned out. But now the heat prevents itself from being dangerous. A general statement of these and other forms of regulation might be valuable. It might indeed serve as a rule of thumb for inventors.

Bancroft[1] gives many excellent examples of regulatory behavior as illustrating his "universal law." This law is that "a system tends to change so as to minimize an external disturbance." Some of the cases he notes are:

The readjustment of prices through supply and demand.

Tears caused by and discharging an irritating substance from the eye.

A splinter causing its own sloughing out.

In chemistry, the occasional prevention of further reaction by some reaction products.

An insult causing a response which may prevent further insult.

The bending of trees to spill the wind.

It is certainly tautologous to say that organisms behave along lines of least resistance, for our only definition of least resistance is the resistance that a system is first to overcome. But any suspicion that the statement of Bancroft's law falls short in a like way of being a synthetic judgment, is removed after he has clarified it by illustration and comment.

Adaptation of a group of animals or plants *by selection* is a case of regulation if we regard the group as an organism. The capacity for all the responses is not resident in all the individual animals or plants, but is distributed among the parts (individuals) of the entire organism (group). The existence of the organism is maintained along with the life of those parts which respond adaptively to the present condition, notwithstanding the death of those parts which are not adjusted so to respond. This is shown in the adaptation of

[1] Bancroft, W. D., "A Universal Law," *Jour. Am. Chem. Soc.*, XXXIII., No. 2, February, 1911.

wheat to climate. A bushel of late ripening wheat will contain some grains of early ripening wheat. Planted under certain conditions, these latter alone will mature, but they will serve as seed for the next crop, which will inherit their characteristics for the most part, and which will be almost entirely early ripening wheat.

When an apparently new structural adaptation is developed in an organism by a set of new conditions, the presumption is that the organism's capacity for this change of structure was previously resident in the organism, and not that the change was wholly caused by the new condition. The condition was the necessary factor which had to be added to the organism's potential capacity, in order that the adaptation should result. An organism may in this way be so adjusted as to respond adaptively to any one of a number of possible conditions which may be mutually exclusive. So when one response is realized, the others may be latent. This is shown by the substitution of hair for wool in the coat of a sheep that is taken to a warmer climate. In the domain of behavior a similar rule is obvious. Here a given stimulus calls forth a particular reaction which is especially fitted to the situation.

The Vital Manifold

Organisms living in an environment of changing conditions are, for the most part, constantly readjusting themselves to the change. They avoid bad conditions and seek better. Or, when an unfavorable condition can not be avoided, a change takes place in their structure which makes it possible for them to live in that condition. If, when in a certain medium some metabolic change takes place in them, which to be set right demands some other medium, they seek out that other medium either by trial and error reactions or, following certain clues present in their surroundings, by some specially appropriate instinctive or habitual reaction. If we admit that such processes are regulatory, we have made a beginning towards defining regulation. We may further say that it is characteristic of organisms having a certain structure. It is the result of the interaction of such organisms and their media. The organism and the media constitute a manifold which, though constantly operating, so functions as to prevent disintegration of the organism. The life-long stability of arrangement possessed by the organism and its offspring further differentiates it from the media and makes most significant the distinction between biology and the inorganic sciences. The field of the science of animal behavior of which the processes in such a manifold constitute the data, is in part hardly to be distinguished from some of the subject-matter of dynamic biology. The former science, however, always classifies these processes on the basis of the *regulation* which they display.

Negative Regulation

Regulation occurs when any process in the manifold which reduces the stability of the organism results in such a change, either in the media (through the organism's migration or otherwise) or in the organism itself, that the stability of the organism is regained, so that the deviation toward instability has come to be *the cause of its own remedy*. Such regulation is the *avoidance* of those states in the organism or of those conditions in the media which are or have become unfavorable to the stability of the organism, so let us call it *negative regulation*.

Frequent examples of negative regulation are found in the behavior of inorganic manifolds, of plants, and of the lower animals. When a boat in a heavy sea rolls to one side it rights itself into the perpendicular again. It does this because of the fact that the further it tilts from the perpendicular the greater is the leverage by which the pull of gravity, which tends to bring it back, is applied. Its behavior conforms to our definition of negative regulation. The way in which paramœcium retains favorable conditions must be described by the same principle.[2] The valve action at the boundary of the optimum will work for the animal's good in either novel or familiar conditions. A river (organism) shows regulation in migrating from its original channel to one of greater stability, and in overcoming obstacles, such as log jams or landslides, which serve as the cause of their own remedy.

In the above examples correction is *the result* of the excess of process, or deviation from stability. The correction and the condition which needs correction may, however, both be the results of the same cause, having no causal effect on each other. For instance, in crayfish oxygen starvation is corrected by the very activity which causes it, namely, walking. The gills are placed so as to be moved by the legs, for which reason walking causes both depletion and repair of the oxygen content of the blood. Another example is found in the protective color changes in the coat of northern mammals. These changes are possibly not the result of the color environment (the seasonal variation of which is a deviation toward instability), but rather the result of some accompanying condition such as food or temperature plus certain internal factors. That is, the brown fur does not become white because of the whiteness of the snow. The cause to which is due in part the occurrence of the snow, namely, a decrease in temperature, is largely responsible for the adaptive change in the color of the fur. Again, for example, the sunshine which on a summer day would otherwise overheat a man, is in part the cause of the breezes which assist in keeping him cool. The cause, that is, which

[2] Jennings, "Behavior of Lower Organisms."

produces the deviation from the optimum brings about also a condition which helps to restore the optimum.

We may then occasionally find this relation between the deviation from stability and its means of correction. The mutual cause of these two processes may indeed be indefinitely remote. This phase of regulation is not recognized in the above definition, so we may add: *Negative regulation also occurs when a process in the manifold which is the cause of a deviation from stability results independently in its correction.*

Positive Regulation

An organism may be so constituted that it reacts to some condition which is favorable, adapting itself so as to obtain benefit from it, even when failure so to react to the condition would cause it no more harm than the loss of an unusual benefit. This form of reaction is sometimes given to a condition which the organism does not reach by locomotion, such as a condition which is generally periodic and has no fixed special position (*e. g.*, a weather condition). But if the organism has means of locomotion, the reaction more usually involves a movement toward the favorable condition. This favorable condition may be only occasionally present or it may be only occasionally needed by the organism. The favorable condition to which the organism reacts may be at a distance from, or may impinge upon, the organism. If it is at a distance it must act mediately upon the organism and the organism must have the power of locomotion in order to take advantage of it. The favorable condition may be relatively fixed in space, such as air at the top of the water, or it may be relatively fixed in time, such as the regular recurrence of sunlight. To distinguish this form of regulation let us call it positive.

Positive regulation occurs when some change in the environment or in the physiological state of the organism causes such an adaptive reaction of the organism or such an alteration in the media that the interaction of the newly arranged organism and media which follows brings about increased stability in the organism. In such a process both organisms and media have a double function. The media act first as the stimulus to the organism's adaptive reaction and second as a contributing cause of the increased stability of the organism. The organism likewise must be set or arranged to adjust or orient itself to the changed conditions and also to interact with the novel media so as to cause increased stability in the new relation. The squirrel's storing its food, the butterfly's seeking its mate, and the prospector's digging for gold are all examples of positive regulation.

In positive regulation the favorable condition and the adaptive change do not always have the direct relation of cause and effect. They may be as well results of a single cause. This is especially true

in the higher forms of behavior, such as the behavior of a group of sympathetic organisms in a colony or society. For instance, Greek philosophy was a cause which has ramified into many results. Largely because of it, and of the development which it caused, the present-day students write their books on science or philosophy, because of it there are laboratories, without which these books would have lacked much material, and printing presses, without which the volumes would never have reached their readers. That same early philosophy is the inheritance of the people and without it the modern book would not be understood. As another example, when the hot weather in spring impels birds to migrate northward it causes also those changes in the country further north which produce food and the proper conditions for raising the young. So we may add: *Positive regulation occurs when a process in the manifold which is the cause of some potentially favorable condition results independently in an adaptive change by which the organism takes advantage of it.*

Both positive and negative regulation may take place as the result of a change merely in the physiological state of the organism and not be due to any variation in the media. Negative regulation is seen under such conditions in the reactions of the over-fed sea-anemone away from food, or in the behavior of a dog that after a time moves further away from a fire the heat of which had at first attracted him. Positive regulation takes place under like conditions when respiration is increased due to exercise, or when the hungry animal goes out to search for food to which previously it had been indifferent. Judgment and reason in the higher animals furnish the best examples under these conditions for positive regulation. Positive regulation usually results in an increased margin of stability which is insurance against future dangers and permits the organism some rest from the activities of negative regulation. The two forms of regulation are combined in the food reaction of most animals. Hunger results in migratory search after food as well as in its capture. Many animals, however, capture food for future use when the conditions of negative regulation are not present. The two forms of regulation are, for instance, combined when a man rises in the morning partly because he is no longer comfortable in bed and partly because he hears the water running into his tub.

The direct interaction between the conditions existing at any given time as well as the resulting adaptations in the manifold may be described as follows:

In negative regulation unfavorable media (present or at a distance) may cause a change in the organism that makes it either resist such media, or avoid or migrate from such media, or analyze or

synthesize such media into innocuous or favorable media. Or some unfavorable part or process in the organism may cause its own elimination or discontinuance, either by interaction with the media, or by action within the organism, or by both of these.

In positive regulation favorable media (present or at a distance) may cause a change in the organism that makes it either interact with such media or enter into or migrate to such media. Or innocuous media (present or at a distance) may cause a change in the organism that makes it analyze or synthesize such media into favorable media. Or some favorable part or process in the organism may cause its own maintenance or continuance, either by interaction with the media or by action within the organism or by both of these.

STEVENSON SMITH.

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THE ANCIENT SPIRIT AND PROFESSOR BABBITT

SOME time ago I had the pleasure of reviewing Professor Babbitt's "Masters of Modern French Criticism" in this JOURNAL;[1] and in a recent issue[2] he has published a courteous reply under the title of "The Modern Spirit and Dr. Spingarn."

Professor Babbitt is much disturbed by my statement that his book lacks "unified and consistent thought" and represents merely "personal bias." I am not certain whether his reply is intended to confirm or refute this statement, since the ideas which he now expresses are exactly those on which I based my original contention. He restates briefly what he had already said in the preface of his book, and I must therefore assume that we are to accept all this as proof of "consistent thought." But consistent thought about what? If he will turn again to my review, he will find this assertion: "The fact is that Professor Babbitt has no esthetic theory. . . . To the questions—What is art? What is literature? What is criticism?—he offers no answers." In his recent reply he does not touch these questions at any point. He explains that literary criticism has much the same problems to face as modern philosophy, that it, too, must deal with the antitheses of intellectualism and intuitionalism, of discipline and anarchy, and so on; and he implies that ideas of this kind vindicate the consistency of his thought in the field of criticism.

I confess, however, that if these utterances are intended as answers to the questions—What is Art? What is criticism?—they are not unlike the answer which my five-year-old son recently gave to

[1] Vol. X., page 693.

[2] Vol. XI., page 215.

the question—What is arithmetic? "It is when you say one and one make two, two and two make four, three and three make six." My son has obviously identified arithmetic and stated some of its problems; he has explained it exactly as we explain anything which we have to face and concerning which we have no "unified and consistent thought." Professor Babbitt, however, has hardly gone so far as to identify criticism in any way that indicates its essential purposes or processes; he has simply stated some of the problems that confront it at this period of time. He is under an illusion when he thinks that his "principles" seem negligible to me merely because they are "too different" from my own to make comprehension possible. I do not disagree with his principles, if by this is meant principles of criticism; I merely find none with which to agree or disagree. I agree with his statement of some of the *problems* of modern criticism, just as I disagree with his statement of others; but I have looked in vain for any indication that he has ever asked himself what art really is, what literature really is, or what criticism really is. It seems to me fair to say of such a book that it lacks unified and consistent thought in the field of literary criticism.

Professor Babbitt does, however, criticize the esthetic theory of others; and I think that here, too, he has shown his confusion of "personal bias" with "consistent thought." He assumes, for example, that the theory of Benedetto Croce, that expression is art, implies of necessity a lack of that intellectual discipline which he regards as the chief need of the culture of our time. If we assume that all expression is art, he argues, there is no place for training, for discipline, for tradition, for ideals, for culture; there is nothing left but anarchy. Nothing could be farther from the truth. Disciplined art and undisciplined art are both art; or perhaps we should rather say that disciplined minds as well as undisciplined ones may express themselves in art. The mistake into which he has fallen is obvious; he is framing his definition, not from the thing itself, but from what he believes to be the best form of it. But bad English is English as much as good English; the art of a child is art quite as much as that of Michelangelo. It may be important to distinguish between the two and to encourage the latter at the expense of the former; but the writer on esthetics should at least understand what they have in common as well as what they differ in; and what they have in common is that both are expression and therefore art. A disciplined mind will express itself differently from an undisciplined one; but until the artist expresses himself he can not create art, and when he expresses himself he has created it. Professor Babbitt imagines that this conception of art must necessarily indicate a preference for the undisciplined form; but it is after all merely an attempt to under-

stand what art really is, and nothing else. It is not an attempt to give practical advice to the men and women of our own time.

Professor Babbitt complains, with more apparent justification, that I have done him an injustice in saying that in his essay on Scherer there is not "a single allusion to literature or art, to the life of the imagination in any of its forms." He insists that in this essay he has discussed Scherer's attitude toward Molière, Sainte-Beuve, Zola, Baudelaire, Goethe, and others. I turn to the passage on Molière, and I find that the author of *Tartuffe* is mentioned in order to justify a quotation from Scherer in regard to—the deficiencies of the French language in the later nineteenth century. I turn to the passage on Zola, and I find that an excerpt from Scherer's essay on Zola is quoted in regard to—the vulgarizing influence of democracy on culture. Is it unfair to say that these are not allusions to "literature or art, to the life of the imagination in any of its forms"? Is it unfair to say that Professor Babbitt is not concerned, in any of these passages, with the way in which criticism interprets creation, but that he is wholly obsessed with the problems of modern culture on their practical side?

This is what Professor Babbitt is interested in, and this alone. He does not care what art or criticism is, but he does care that young men and women should have discipline, training, tradition, ideals. His mind is still in the period of Græco-Roman culture, when literature was simply regarded as a preparation for the more important activities of life; and as Quintilian in writing a book on the Orator really wrote a treatise on the education of Roman youth, so Professor Babbitt in writing about modern French critics has really written a treatise on our system of academic or literary education. His book is a contribution to American culture; it is, as I have said, a dignified and valuable work; but it adds little to our knowledge of the history or theory of criticism. If Professor Babbitt is inclined to take this statement too seriously, I can only remind him that Burton's "Anatomy of Melancholy," while adding little to our knowledge of neurology, and "Gulliver's Travels," while adding nothing to our knowledge of geography, lose little if any of their interest on this account.

J. E. SPINGARN.

NEW YORK.

REPLY TO DR. SPINGARN

THE answer of my book to the question, What is criticism? is that criticism is primarily judgment and selection and only secondarily comprehension and sympathy. By discarding the traditional basis of judgment and failing to put anything in its place criticism

has, I affirm, fallen into anarchy and impressionism. Does Dr. Spingarn hope to persuade any one that a discussion of this all-important problem of standards and judgment and its relation to the work of the chief French critics of the nineteenth century is without bearing on either the theory or history of criticism? The basis on which I rest my own critical standards is, as I tried to show in my reply to his review, positive and immediate; it involves no return to the past; Dr. Spingarn's treatment of me as a Græco-Roman survival is therefore irrelevant; it strikes me, if I may be allowed the phrase, as an attempt to draw a red herring across the trail.

In accusing Croce and his American disciple of readiness to sacrifice the true form and symmetry of life to mere expression, I did not have in mind the assertion that art is only expression, but a far more radical assertion—namely, that beauty itself is only expression.[1] However, the statement that the art of a child is as much art as that of Michelangelo is a sufficiently flagrant example of the primitivism against which I protest; of the attempt to define art solely in terms of the lower spontaneity—in terms, that is, of the instinctive, the unconscious, the irrational. A complete definition of art would not eliminate the higher or human spontaneity, by which I mean the power to curb or control the passion for expression and impose upon it form and symmetry with reference to some adequate end. For over a century naturalism in both its intellectual and emotional forms has, instead of looking forward to ends, been groping its way back to origins. A fruitful reaction against our present confusions will surely put prime emphasis on the truth contained in the Aristotelian dictum: "The end is the chief thing of all."

Any one who wishes to form an opinion as to the justice of Dr. Spingarn's comment on the "Scherer" has only to compare this comment with the essay itself. I have no fear as to the verdict.

IRVING BABBITT.

HARVARD UNIVERSITY.

REVIEWS AND ABSTRACTS OF LITERATURE

Social Environment and Moral Progress. ALFRED RUSSELL WALLACE. London, New York, etc.: Cassell and Company. 1913. Pp. 158.

The purpose of this short, but most interesting and popularly written volume, which may come to be considered the crowning point, if not the *magnum opus*, of its author's long-continued work, is "to bring together the evidence in support of this view [that actual morality is largely a product of the social environment], to distinguish what is permanent and inherited and what is superficial and not inherited, and to trace out some of the consequences as regards what we term 'morality'" (p. 3). The

[1] Croce, "Estetica," page 81.

first part of the book, which is termed "historical," first, defining character as "the aggregate of mental faculties and emotions which constitute personal or rational individuality" (p. 4), attempts to show by historical and literary evidence that as a basis for morality it has shown no essential advance during the historic period; and secondly, with some statistical references, sketches with vigorous pen the injustice, the horrors, the moral degradation of the nineteenth-century environment. In so far as education and the superficial inducements of conventional morality have no hereditary effects, while true moral character, though hereditary, is not cumulative, "it follows that no definite advance in morals can occur unless there is some selective or segregating agency at work" (p. 37). The natural moral character of the race is good—hospitality, for instance, is a universal virtue (p. 101); it is the social environment which is evil and which ruthlessly prevents the attainment of full moral stature corresponding to the probable finality of the human form. Man, therefore, as that animal which alone molds his environment, may proceed to better his condition by its readjustment in a manner and for a purpose to be suggested in Part II.

So far there is probably nothing new or disputable for readers who assume the "dynamic" standpoint in sociology, though the view resembles that which H. G. Wells, referring to Compte and Frederick Harrison, has recently described as the belief "that there was once a stable condition of society with humanity, so to speak, sitting down in an orderly and respectable manner; that humanity has been stirred up and is on the move, and that finally it will sit down again on a higher plane, and for good and all, cultured and happy, in the reorganized positivist state." Again, it might be objected, perhaps, that the products of genius available for educational purposes, while not hereditary when acquired nor cumulative when innate, can yet be cumulatively transmitted by education. There is a social as well as an individual heredity. Moral progress might, therefore, be in a degree possible without positing any inheritance of the qualities of genius or any artificially liberated (though intrinsically natural) selective potentiality. As, however, Wallace heartily favors equality of educational opportunity as part of his remedial philosophy, this point need not be pressed. The indictment of existing conditions reminds us of the querulous tone of Mr. Spencer's "Facts and Comments," and is drawn in striking contrast to the author's fundamental faith in the essence of human nature. Here we may remember that the author of "The Wonderful Century" found much therein to praise as well as to deplore.

Part II. is entitled "Theoretical." After a brief presentation of the facts of natural selection, among animals (Ch. XIII.), and as modified by mind (Ch. XIV.), and of the laws of heredity and environment, the last two chapters are concerned with the author's idea of initiating through a new form of selection (Ch. XVI.) an era of moral progress (Ch. XVII.). The non-heredity of acquired moral characteristics is here defended as not merely true, but fortunate. How glad we may be that the dreary education in brutality and superstition afforded by the Middle Ages could have no hereditary influence. And yet here we may ask how Mr. Wal-

lace was so confident that the many tokens of moral inferiority which history furnishes were but superficial, in no way contaminating the fundamental goodness of our nature. If we judge not mankind's nature by its fruits how, then, shall we estimate its value? And if you answer that those fruits were largely the product of a compromise with the hostile environment, may we not ask again, if man is the modifier of his environment why do we credit him only with his will, not with his deeds? Can social environment and that human nature which is in and of it be considered separately? Not, I think, without some such speculative doctrine as that of the "Divine Influx," to which in the last resort Mr. Wallace feels impelled.

The substance of this second part is that by the diminution of economic pressure there will be a possibility of selection on the part of the female who, under existing conditions, is for the most part driven to marriage by economic stress rather than by choice. From the standpoint of the female the argument is persuasive, but from the standpoint of the male does not the opposite hold good? Under a system of economic pressure, such as to-day obtains, it is the least able worker who is least able to support a wife (omitting from consideration the injustices of transmitted wealth) while, under the humanitarian conditions which Wallace would fain have seen prevail, the feeblest male will have less difficulty in finding himself a mate. That there will be no females so tasteless as to select the less desirable males can hardly be maintained, even granting the belief that they would *prefer* the more desirable, for that the preponderance of males, brought about by shifting the incidence of accidental death, will "give to women the power of rejecting all the lower types of character among their suitors" (p. 148) is at least a speculative interpretation of the slight excess of male births. This excess being usually traced to a provision of nature accommodating the population to that greater incidence, the two may be expected to disappear together. From the male's point of view, therefore, the true selective agency, if also the cause of widespread misery and social unrest, would appear to be the old malthusian law with its implication of an inevitable struggle for existence within the economic field. It is true Wallace has been at pains to discredit this law because "when poverty is abolished and neither economic nor social advantages will be gained by early marriage there can be no doubt it will be generally deferred to a later date" (p. 143), and hence, on Galton's showing, fertility will decrease. But supposing the government manage "to organize the labor of the whole community for the equal good of all" (p. 155)—Wallace's final solution of the whole matter—is the inference to the postponement of marriage at all a reasonable one? Is it not precisely economic pressure which leads to its frequent postponement by young men, and therefore perforce by women, to-day, and when there is nothing to prevent marriage at an early date, why should we not suppose it will occur earlier rather than be still further delayed? Apparently Wallace relies on educational persuasion, which seems a none too reliable motive. It is true that marriage to-day occurs later among the better off, in a degree roughly proportional to their position in the social scale,

but as this is due to greater economic obligations at least as much as to causes of culture or perhaps to a mixture of the two, it can not from this be inferred that there would be a further postponement among all classes either with the advent of better conditions in general, or with the attainment of a higher average of general culture. On the contrary, an earlier average of marriage has been taken as a reliable standard of realized or immediately anticipated prosperity in a given territory. "Statistics of marriage during and after so-called economic crises," says Parsons, "are plain on this point." Thus the desirability of free selection on the female's part seems to be decidedly modified, if not rendered wholly doubtful, by the necessarily concomitant elimination of existing selective agencies operating in economic terms upon and through the male. The social argument would thus point rather to an increasing inheritance tax and greater equality of educational advantages than to conceding "full political and social rights" (p. 148) to women.

Perhaps, however, there is something to be said on either side, and it is at least cheering to have before us so clear an argument for the solution of questions widely vexing us to-day, wherein the quasi-medical aspect is specifically discounted (pp. 127 ff.), and the procedure is strictly pragmatic, in place of insisting upon the indefinable "natural rights" of a political philosophy now outgrown. Thus are eliminated two features of the controversy of which many of us are becoming increasingly weary. We are wisely reminded that social amelioration may more fitly become an object of legislation than bungling attempts to tamper with the private functions of the individual, and Wallace well asks how we can entrust governments with the technical removal of minute effects, that have shown themselves so largely incompetent to deal with the underlying cause. "Let them devote all their energies to purifying this whitened sepulcher of destitution and ignorance, and the beneficent laws of nature will themselves bring about the physical, intellectual, and moral advancement of our race."

REGINALD B. COOKE.

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The Making of Character: Some Educational Aspects of Ethics. JOHN MACCUNN. New York: The Macmillan Company. 1913. Pp. 226.

Perhaps the making of the English character is really so simple a process as this little book would indicate. It may well be that the charges of hypocrisy and pious smugness leveled by irritated geniuses against the English people are quite unjust, and that the simple moral face and the indomitable moral optimism which they present to the world really represent a perfect uncomplicatedness of spiritual process within. But as they appear to a foreigner, the psychologico-ethical theories of the English writers from Bentham down to Arnold Bennett can only be described as exceedingly weird. This particular book, from the note of liberality which runs through it, is evidently intended by the author to be rather advanced, but his unanalytic treatment of heredity and the instincts, his complacent review of the influence of bodily health, the influence of nature, family,

school friendship, livelihood, citizenship, church, moral ideals, etc., is all quite uncomplicatedly English. He speaks always as if these concepts represented so many parcels of spiritual food which the young, growing, moral individual, purely *quâ* individual, assimilates as he would bodily food. The function of the ethical teacher than becomes simply to lay before the individual youth the proper fare, and the healthy appetite can be depended upon to do the rest.

All that sociological view of the moral process which sees the growth of the individual soul as the gradual coming of the raw human animal with its powerful instincts under a complex system of social constraints,—being gradually assimilated into a tenacious fabric of group-ideas and folkways,—is ignored in a book like this. There is constant confusion made between the moral, as the individual taking of the social imprint, and as the conscious critical selection and rejection of folkways and ideas in accordance with some imagined ideal, or rather some imagined social group with which one feels identified and sympathetic. The author speaks one moment as if taking the faithful impress of existing institutions of church, law, family, and state, constituted the making of moral character, and, in the next discusses the forming of moral judgment which, if it means anything, means the ruthless slaughtering of many of those same faithful folkways of the orthodox codes. These conflicts, which would seem to the sociologist the very heart of the ethical problem, are treated with scant attention in this book. And the enormous rôle of the sexual life, with its fantasies and appeals, as well as the rôle of the affective life in general in the formation of "character"—the very word is highly ambiguous until we know whether it is to mean the smooth, unimpeachable, uncriticized running of the individual cog in the social mechanism, or the independent critical attitude which constructs its own "morality" out of the various group-codes—are ignored in the characteristic English way. Of course one hardly likes to say that these things may not all be congenitally absent from the English consciousness and experience. But if so, their thinking on ethical matters can scarcely be of universal application and validity.

Originally written and published in 1900, this book could not be expected to quote the newer ethical and psychological schools such as those of Dewey, Montessori, and Freud, for instance; our author's authorities are rather Plato, Aristotle, Kant, Wordsworth, Burke. One might, however, have asked that these worthies be supplemented by a little personal introspection, or sociological observation. The chief value of such a book is, I suppose, to bring a warm glow or vague illumination to the pious heart of some non-conformist parent. But it is a little difficult to see why it should have demanded four reprintings in the United States of America.

RANDOLPH S. BOURNE.

BLOOMFIELD, N. J.

The Foundations of Science. H. POINCARÉ, tr. by G. B. Halsted. New York: The Science Press. 1913. Pp. 553.

Under the above title are reprinted Professor Halsted's translations of

"Science et L'hypothèse,"[1] and "La Valeur de la Science,"[2] together with a translation of "Science et Méthode,"[3] which here appears in English for the first time. Professor Royce's introduction to "Science and Hypothesis" is retained, together with the translator's prefaces to the first two volumes, but the author's prefatory essay to the English edition of "The Value of Science," appears as the introductory chapter to "Science and Method," as in the French editions. The whole is provided with a suitable index, and a brief, somewhat ill-balanced, biographic sketch by the translator prefaces the volume.

It is unfortunate that the three volumes are bound as one, for not only is the result awkward by its bulk, but also the necessity of duplicating their possessions is imposed upon owners of the first two works who are desirous of possessing the third; and, moreover, there has recently appeared a fourth volume,[4] quite coordinate with the other three, which, if Poincaré's philosophical writings are to be brought within one cover, should certainly be incorporated with them.

The succession of Poincaré's books indicates a constantly growing grasp of the problems with which he deals. Beginning with a study of the forms of scientific reasoning in "Science and Hypothesis," he passes, in the "Value of Science," to the problem of their contact with fact, and arrives at an interesting Pythagorean definition of the objective as nothing but mathematical relations.. In "Science and Method" there is presented an admirable study of creative imagination showing its peculiarly intimate connection with esthetic processes. This is followed by a review of the methods of mathematics, mechanics, and astronomy which includes a highly illuminating estimate of the significance of that disruption of our most cherished physical concepts which has been instigated in contemporary science by such discoveries as that of radioactivity.[5]

HAROLD CHAPMAN BROWN.

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JOURNALS AND NEW BOOKS

MIND. January, 1914. *Aristotle's Refutation of "Aristotelian" Logic* (pp. 1–18): F. C. S. SCHILLER. – It is misleading to confine (as is the present custom at Oxford) the study of Aristotle's Logic to the *Posterior Analytics*, the treatise displaying Aristotle's formal logic with its doctrine of Contradictory Opposition. Illustrations are adduced to show that in Aristotle's subsequent scientific discussions the law of contradiction plays no part. Formal logic may be descriptive of the abstractly universal, but not of the concrete and practical. *The Meaning of Reality* (pp. 19–40): J. S. MACKENZIE. – Briefly sketches the various senses in which the term

[1] French, 1902; English, 1905.

[2] French, 1905; English, 1907.

[3] French, 1907.

[4] "Dernières Pensèes," 1913.

[5] The "Value of Science" was reviewed in this JOURNAL, Vol. II., page 630, and a general summary of Poincaré's whole position appeared in Vol. XI., page 225.

reality is used, concluding with the strictly metaphysical meaning "of that which is substantial or independent." On the basis of this meaning there follows an elaborate enumeration and classification of metaphysical theories. *Some Preliminary Considerations on Self-Identity* (pp. 41–59): HAROLD H. JOACHIM. – Self-identity can not be construed as descriptive of our bodies viewed either as atoms or as an aggregate of atoms or as chemical or biological processes; neither is self-identity to be found in the immediacy of self-feeling. We are to view "our spiritual selves as the individuations of the universal spirit—as that or nothing." *A Criticism of Dr. Mackenzie's Philosophy of Order* (pp. 60–83): L. P. SAUNDERS. "I shall try to show that Dr. Mackenzie has really not contributed anything in the paper under discussion to the solution of philosophic problems. He has mainly, I think, changed their names, and when he has not done this he has, I believe, confused issues." *Discussions: Aristotle's Theory of Tragic Emotion* (pp. 84–90): A. W. BENN. *Idealism and the Reality of Time* (pp. 91–95): BERNARD BOSANQUET. *Is Inversion a Valid Inference? A Rejoinder* (pp. 96–98): L. E. HICKS. *Truth and Working* (pp. 99–101): ALFRED SIDGWICK. *The Analysis of Categorical Propositions* (pp. 102–103): BERNARD BOSANQUET. *Critical Notes:* B. Bosanquet, *Logic, or the Morphology of Knowledge:* R. LATTA. F. Aveling, *The Consciousness of the Universal; a Contribution to the Phenomenology of the Thought Processes:* C. W. VALENTINE. C. A. Mercier, *Conduct and Its Disorders, Biologically Considered:* W. L. MACKENZIE. A. Müller, *Wahrheit und Wirklichkeit: Untersuchungen zum realistischen Wahrheitsproblem:* C. D. BROAD. *New Books. Philosophical Periodicals. Note.*

ARCHIVES DE NEUROLOGIE. January, 1914. *Contribution à l'Étude de le Cécité Psychique des Mots et des Choses* (pp. 1–10): PROFESSOR BERNHEIM. – In visual amnesia, or psychic blindness, the patient sees, but can not recognize the object seen. He ignores its name and its meaning. *Sur les Aliénations Mentales d'Origine Syphilitique* (pp. 11–32): A. MARIE. – In the presence of a parasyphilide, one must proceed to the examination of the blood and of the cerebrospinal fluid. If the blood is positive, a general antisyphilitic treatment is indicated. If the cerebrospinal reaction alone is found, or is predominant, the central nervous system must be treated directly. *Le Traitement des Buveurs* (pp. 33–42): DR. LEGRAIN. – There are two stages in the scientific treatment of alcoholics: (1) disintoxication; (2) reeducation, or psychotherapy. *Revues des Congrès et des Sociétés. Analyses Bibliographiques.*

Boutroux, Emile. Natural Law in Science and Philosophy. New York: The Macmillan Company. 1914. Pp. 218. $1.75.

Branford, Victor. Interpretations and Forecasts: A Study of Survivals and Tendencies in Contemporary Society. New York: Mitchell Kennerly. 1914. Pp. 424. $2.50.

Day, Henry C. Catholic Democracy: Individualism and Socialism. New York: Longmanns, Green, and Company. 1914. Pp. viii + 296. $1.80.

Dowd, Jerome. The Negro Races. Vol. II. New York: The Neale Publishing Company. 1914. Pp. 310. $2.50.

Haldane, J. S. Mechanism, Life and Personality. New York: E. P. Dutton and Company. 1914. Pp. vii + 139. $1.00.

Holt, Edwin B. The Concept of Consciousness. New York: The Macmillan Company. 1914. Pp. xvi + 343. $3.25.

Juvalta, E. Il Vecchio e il Nuovo Problema della Morale. Bologna: Nichola Zanichelli. 1914. Pp. xii + 137.

NOTES AND NEWS

THE publishing house of Quelle and Meyer, of Leipzig, has launched a weekly periodical, *Die Geisteswissenschaften,* whose scope is to be unusually broad, including philosophy, psychology, mathematics, science of religion, science of history, philology, history of art, science of law, political science, economic and social sciences, and pedagogy. The editors, Messrs. Otto Buek and Paul Herre, hope to make of it a clearing house where scholars may exchange opinions and lose, in fruitful intercourse with one another, the narrowness of their specialties. They hope also to give an exact idea of the present state of the scientific disciplines and promote timely discussions of new problems and their proposed solutions. The enterprise undoubtedly responds to a vital need of the present day and ought to militate most beneficially against excessive scientific specialization.

On the occasion of the seventieth anniversary of the birth of Friedrich Nietzsche, on October 15, it is proposed to raise a monument to his memory on the hill near Weimar, in the neighborhood of the Nietzsche Archiv. A considerable fund has already been collected for the purpose, and any surplus that may accrue will be used for the support of the Archiv, which is under the guidance of Nietzsche's sister. Contributions should be forwarded to Dr. Richard Oehler, the Librarian of Bonn University, 70 Konigstrasse, Bonn, or the Nietzsche Monument Fund, care of London County and Westminster Bank, 109–111, New Oxford Street, London.

AT Columbia University the following changes are announced: Dr. Harry L. Hollingworth has been promoted to an assistant professorship of psychology at Barnard College; Henry Slonimsky (Ph.D., University of Marburg), has been appointed to a lectureship in philosophy made vacant by the leave of absence of Dr. William F. Cooley, who goes to Vassar College for a year; and Mr. Roberts B. Owen, assistant in philosophy at Cornell University, has been appointed lecturer in philosophy.

DR. JAMES WARD, professor of mental philosophy and logic, at Cambridge University, has been nominated to represent the University on the occasion of the celebration at Oxford on June 10 of the seventh centenary of the birth of Roger Bacon; and Dr. Sorley, Knightbridge professor of moral philosophy, to represent the University at the fifth International Congress of Philosophy to be held in London next year.